AdSpeed
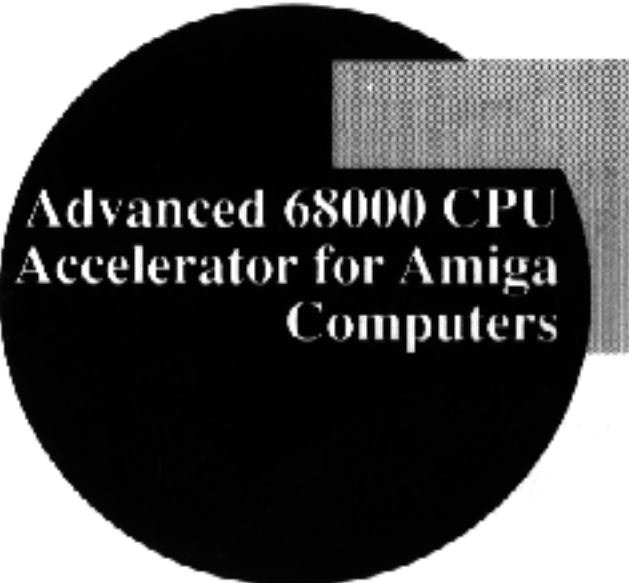
Advanced 68000 CPU
Accelerator for Amiga
Computers

ICD

Owners Manual

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Introduction

AdSpeed is a 68000 accelerator for all 68000-based Amiga computers (500, 1000, and 2000). It runs at 14.3 megahertz (MHz), twice as fast as the 7.16 MHz CPU a standard Amiga uses. It won't double the speed of everything your computer does, for reasons described below, but it will produce a noticeable improvement in performance for almost all of your programs.

Because of the nature of the Amiga's operation, some programs will show much more improvement than others.

How It Works

The Amiga is designed with two address and data busses. Both of these are designed to operate at 7.16 MHz, not faster.

The *custom chip bus* is shared by the 68000 central processing unit (CPU) and the custom chips used by the computer for graphics, sounds, and other features. When the custom chips have access to the bus, they can directly manipulate the data stored in *chip RAM*, the random access memory located on this bus.

Since DMA on the custom chip bus is invisible to the CPU (and AdSpeed), chip RAM is not cached by AdSpeed. This has little effect on the performance of AdSpeed, since program code in all but the strangest programs will always load into FAST RAM first.

The *expansion bus* is restrained to 7.13MHz to allow compatibility with existing expansion devices. FAST RAM, hard drive interfaces, and other devices use this bus.

DMA on the expansion bus (usually hard drive interfaces) is visible to AdSpeed. When it occurs, only the addresses accessed are invalidated in the cache.

Even with the 68000 running at 14.3 MHz, it must emulate an 7.16 MHz bus cycle when accessing the RAM to remain compatible with the rest of the system. With nothing other than a high speed 68000, little performance increase will be realized.

AdSpeed uses a high speed static RAM cache and cache tags to gain its speed increases. When an address is needed by the CPU, the cache tags are checked to see if that information is already in the cache. If it is not, the data is read normally from the computer's RAM, and no speed increase is realized. It is also stored in the cache. If the information is already in the cache, the CPU

can use it without having to access the computer's RAM. This allows for a full 14.3 MHz bus cycle. Information is kept in the cache until the space is needed for newer information.

This RAM cache is most effective with loops in programs, since the whole loop can be stored. Programs using many such loops can run almost twice as fast as usual.

AdSpeed Configuration

AdSpeed has two jumpers that configure aspects of its operation. These are the pairs of pins **A & B** and at the end of the board. To change the settings of these jumpers, move the supplied jumper plug so that it covers both posts.

A & B determine the starting speed. If they are not connected, **AdSpeed** will begin in 14.3 MHz high speed mode. This is the way **AdSpeed** is set when shipped. If **A & B** are connected, **AdSpeed** will begin in true 7.16 MHz mode.

A & B should be connected if you wish the computer to boot in 100% compatible 7.16 MHz mode. This is useful for copy protected games that don't work properly when accelerated. This does *not* permanently disable **AdSpeed**. You may switch it back to high speed mode through software.

You may optionally install a switch to the **A & B** jumper to control speed switching. This is described later in the **Optional Speed Switch** section.

Jumper pair **C & D** are for future options. These should be left open.

Optional Speed Switch

You may, if you wish, install a hardware switch to **AdSpeed** A & B pads. This switch will perform two different but related functions.

The first function of the switch is to determine the starting speed. If the switch is open, **AdSpeed** will boot in 14.3 MHz mode. If it is closed, **AdSpeed** will boot in 7.16 MHz mode. You may change from the default speed with either the switch's second function or the software.

The second function of the switch is to change speed while the computer is running. If the switch is opened, the speed will change (if necessary) to 14.3 MHz. If the switch is closed, then the speed will change (if necessary) to 7.16 MHz.

Note that the position of the switch does not necessarily reflect the operating speed of **AdSpeed**, since the speed may be changed through software. For

example, if the switch is in the 14.3 MHz position and you use the program **AdSpeed** to change the speed to 7.16 MHz, you will have to move the switch to the 7.16 MHz position and back to the 14.3 MHz position to change the speed to 14.3 MHz.

To install this option, locate a suitable single pole single throw switch and mount it somewhere on the case. Connect the switch to the A & B pad pair with 30 gauge wire. You can label the positions to help remember which is which if you wish.

Installation

Installation of **Ad*Speed*** is simple. The hardest part is opening your computer.

Opening an Amiga 500

Disconnect your keyboard, monitor, mouse, power cord, and anything else connected to your computer. You will need a T–10 Torx® screwdriver. Turn your computer upside down. Remove the three screws along the front edge of your computer and the three along the rear edge. Turn the computer back up and lift the cover off. Note that you may have to move the cover slightly to the right to get it over the floppy drive eject button.

Note the orientation of the cable going from the keyboard to the main board of your computer. Either record the colors or mark the connector so that you will be able to replace it correctly. Unplug this cable and the ground strap that connects the keyboard to the shield around the floppy drive. Then lift the keyboard slightly backward and off.

Remove the four Torx screws holding the upper shielding in place. These are around the front left side.

Bend up four tabs holding the shielding in place. Three are near the floppy diskette drive and one is at the back left corner. Lift the shielding off.

Opening an Amiga 1000

Disconnect your keyboard, monitor, mouse, power cord, and anything else connected to your computer. Open the panel on the front, loosen the screws holding the 512K RAM expansion, and remove it.

Turn your computer upside down. Remove the five screws sunken in holes on the bottom holding the case together. Turn the computer right side up
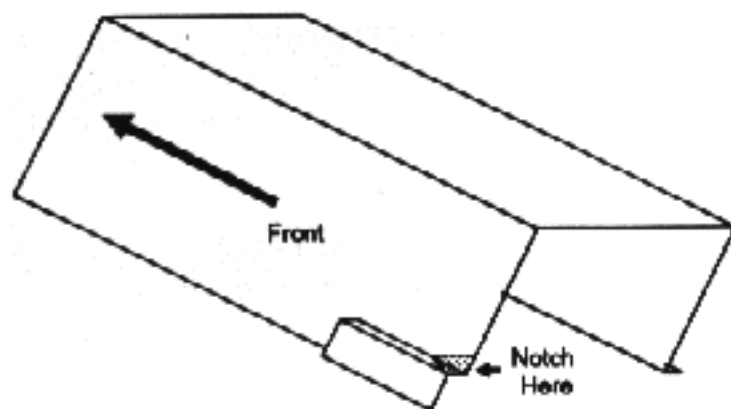
Front

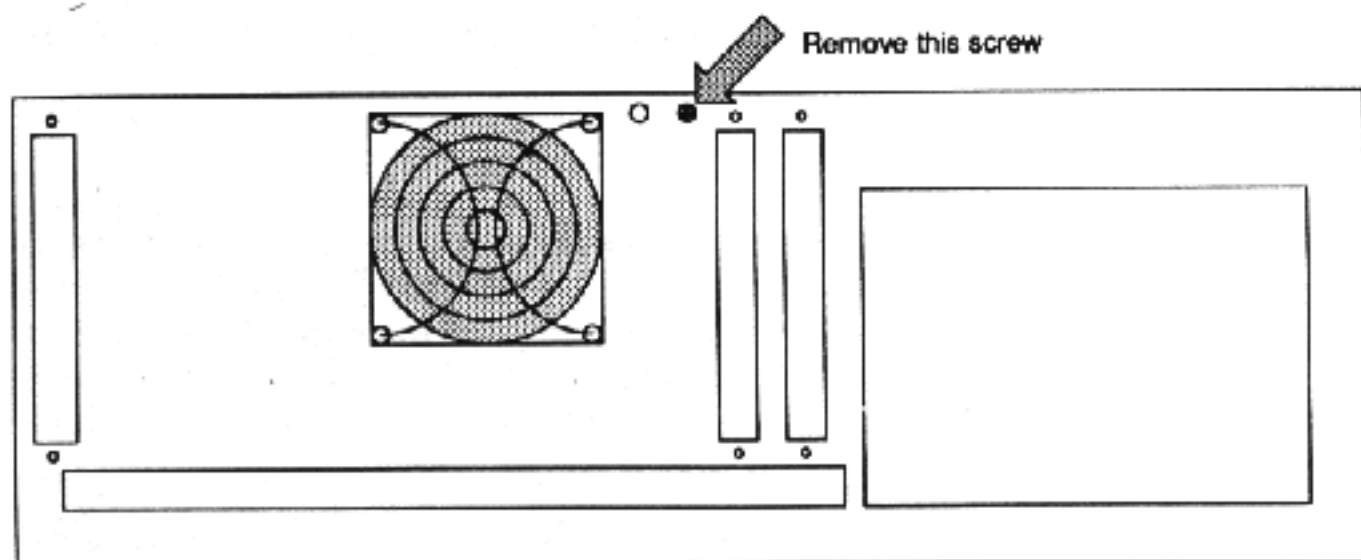Notch
Here

Figure 1

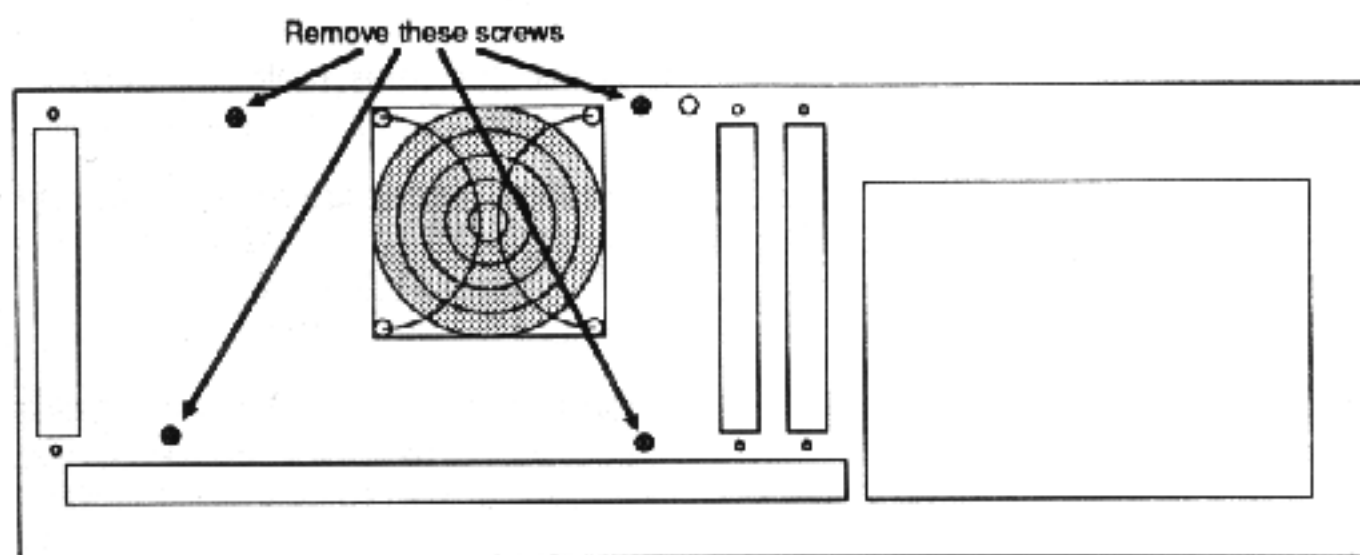Remove this screw

Figure 2

Remove these screws

Figure 3

and remove the top. If this is the first time you have had your computer open, be sure to admire the signatures inside the top of the case. Loosely put the screws into the holes in the top so that you don't lose them.

Remove the main shielding. It is held in place by fourteen screws and two twisted tabs.

Carefully remove the front panel. The power LED will pull from the cover. The drive LED will unplug.

Disconnect the floppy diskette drive housing. It is held in place by four screws and four spacers. The spacers may be loosed and removed with a flat-bladed screwdriver.

Disconnect the floppy diskette drive from its mounting frame. be careful not to subject the drive to sudden jolts that could cause alignment problems.

You will need to cut a notch in this floppy drive mounting frame as shown in figure 1 to prevent it from shorting to Ad*Speed*. You can do this with tin snips, a hack saw, or a file.

Reconnect the floppy diskette drive to its mounting frame. It will be easier to install Ad*Speed* if you wait until later to reconnect the frame to the computer.

Opening an Amiga 2000

Disconnect your keyboard, monitor, mouse, power cord, and anything else connected to your computer. Remove the four screws at the bottom of the sides of your computer and the screw in the top middle of the back as shown in figure 1. Make sure you remove the correct screw from the rear of your computer.

Pull forward and lift off the top cover of your computer.

The power supply/disk drive subassembly is held into place by seven screws. Locate and remove the four screws on the rear of the computer shown in figure 2. Then locate and remove the three screws on the front on the computer that hold this subassembly in place. Two of them are below the large (5¼") drive bay. The other one is just to the left of the large drive bay.

Installing Ad*Speed*

Locate the 68000 chip in your computer. It has 64 pins and will be the largest integrated circuit in the computer. In the 500, it is on the left side of the

computer next to the expansion port. In the 1000, it is directly behind the floppy disk drive. In the 2000, it is near the front, just to the left of the drive bays. Note on which end the notch on the chip is located.

With a small screwdriver or IC extraction tool, remove the 68000 from the computer. If using a screwdriver, pry gently under alternate ends until the chip is free. Set the CPU chip aside aside.

Plug AdSpeed into this socket so that the notch on the large chip on AdSpeed points in the same direction the old CPU chip did. Make sure all the pins line up with the holes. Push AdSpeed into place. That's it!

Reassemble your computer.

The AdSpeed Program

The program AdSpeed allows you change the operating mode of your AdSpeed at any time. It also displays the current operating speed.

To run the program AdSpeed, just double-click on its icon or type its name in a CLI. You may also add it to your startup-sequence. AdSpeed detaches itself from the CLI, so you don't need to use the run command.

When run from the CLI, the program AdSpeed can be used

Once run, AdSpeed opens a small window on the Workbench screen, so small that only the title bar and close, front, and back gadgets are visible. The title bar shows the current operating speed of the computer.

To use the program, click on the AdSpeed window to make it the active one. Then press and hold the right mouse button to activate the menu bar. While still holding the right button, move the mouse pointer to the word "AdSpeed" in the menu bar. A menu will drop down. Move the pointer to either the "14 MHz" or "7 MHz" selection and release the mouse button. The computer will switch to that operating speed.

To quit the program, click on the close gadget of the window.

Programming Information

The following C program demonstrates how to detect the presence of Ad-*Speed* and switch it on and off:

```
/*
    Sample code of Manx C compiler
*/


#include <ctype.h>
#include <stdio.h>

AdSpeedOn() {                          /* Turn AdSpeed on */

    #asm
    move    #0,$b00000
    #endasm
    }

AdSpeedOff() {                         /* Turn AdSpeed off */

    #asm
    move    #0,$b10000
    #endasm
    }


long TestTime() {                      /* Determine current speed of CPU */

register int Result;                   /* D4 with Manx compiler */

    Forbid();                          /* Turn off task switching */

        #asm
        movem.l    d0/d1,-(sp)

        clr.l  d4                      ;Result

        move    $dff004,d0             ;Initial vertical scan position
WaitLoop:
        move    $dff004,d1             ;Wait until vertical position changes
        cmp d0,d1
        beq WaitLoop

WaitLoop2:
        addq.l #1,d4                   ;Start counting
        move    $dff004,d0             ;Wait for another change in vertical position
        cmp     d0,d1
        beq     WaitLoop2
```

```
        movem.l    (sp)+,d0/d1
        #endasm

    Permit()                                /* Turn task switching back on */


    return(Result)
    }



main() {

int Speed;

    if (TestTime() > 0x12) Speed = 1;      /* Save current AdSpeed status */
    else Speed = 0;

    AdSpeedOff();
    if (TestTime() > 0x10) printf("No AdSpeed\n");
        else {
            AdSpeedOn();
            if (TestTime() < 0x12) printf("No AdSpeed\n");
            else {
            if(!Speed) AdSpeedOff();        /* Restore original AdSpeed Status */
            printf("AdSpeed present\n");
            }
        }

    exit(0);
    }
```

Compatibility

There are very few programs with which **Ad*Speed*** will not be compatible in high speed mode. Programs that depend heavily on the time it will take to execute instructions will not work well. Some programs, especially games, may run too fast. Others, such as pseudo graphics mode viewing programs, may produce a garbled display. In general, any program that assumes that instruction execution will take a specific amount of time will not work as expected.

Programs that test for the existence of RAM by writing to an address and then reading it will also not work properly when **Ad*Speed*** is turned on. When the address is written, the value is also written to the cache. When the address is subsequently read, the information is read from the cache. It is usually sufficient to turn off **Ad*Speed*** before the program is run, then back on (through hardware or software) after the RAM test is complete. ICD's

AdRAM program, supplied with AdRAM 520 and AdRAM 540 memory expansions, is an example of such a program.

Expansion devices with auto–config shared memory areas, such as bridge boards, will not operate properly when Ad*Speed* is turned on. This is unavoidable when using a cache, since the shared area is in norrmal auto–config memory arease. Turning Ad*Speed* off will allow these devices to be accessed normally.

Switching Ad*Speed* to normal 7.16 MHz mode, either with software or the switch as described earlier, will solve compatibility problems. Your computer will perform as if Ad*Speed* was not installed. Fortunately, very few programs have problems running at high speed.

Other Amiga Products from ICD

ICD offers a variety of products for Amiga computers, and more are under development. Everything is designed and tested in–house, a fully integrated development and production system that leads to unsurpassed quality.

If you don't see what you want here, give us a call. We may already have such a product, but even if we don't we are always interested in hearing what you have to say.

AdRAM 540

If you have an Amiga 500 computer and need more RAM, the AdRAM 540 is the answer. You can add up to four megabytes in the A501 bay. The RAM can be added a half meg at a time to suit your needs. With a Super Agnus, you can easily get one meg of chip RAM, too.

AdRAM 560D

If you have an Amiga 500 computer and have already installed an AdRAM 540, the AdRAM 560D will give you an additional two megs of RAM! This daughterboard simply and quickly plugs into the AdRAM 540. Installation couldn't be simpler. The AdRAM 560D is fully populated with a full two megabytes of RAM.

AdRAM 2080

Add two, four, six, or eight megabytes of auto–configured fast RAM to your Amiga 2000 with the AdRAM 2080 board from ICD. You can add the RAM in two megabyte groups at any time — no need to fill it up at once. And the

six megabyte configuration is great if you have an accelerator card or bridge board, allowing you to add all the RAM possible. Standard 1 meg by 1 bit RAM chips are used.

AdSCSI 2000

ICD's AdSCSI host adapters (hard drive interfaces) for the Amiga 2000, 2500, and 3000 offer you performance, flexibility, and price that you won't find anywhere else. These are just a few of the features that set AdSCSI 2000 apart:

High data transfer rates. AdSCSI 2000's clean design and advanced intelligent buffering provide data transfer rates faster than anything else we've seen, DMA or not. In the all-important small block transfers, AdSCSI 2000 is up to three times as fast as the competition.

Removable media support. No host adapter gives you more power and flexibility. Disk changes are automatically performed. Any media cartridge can be partitioned as you wish. Removable media support is not limited to just a few drives. Any drive following the SCSI Common Command Set is supported.

Easy to use software. ICD's point-and-click software makes hard drive formatting and partitioning as easy as possible, while offering options to make it as flexible as possible. You won't have to edit a mountlist or remember the number of heads and cylinders.

Other features include Commodore SCSI Direct and Rigid Disk Block conformance for compatibility with third party products, auto—booting from Fast File System partitions, and full AmigaDOS 2.0 compatibility.

AdSCSI 2080

For applications where expansion slots in your Amiga 2000 computer are in high demand, the AdSCSI 2080 combines all the features of the AdSCSI 2000 (except the "hard drive card" option) and the AdRAM 2080. Standard 1 megabyte SIMMs allow you to add zero, two, four, six, or eight megabytes of RAM to your computer. The SCSI host adapter is the same design as the AdSCSI 2000, providing the same high speed and removable media support.

AdIDE

AdIDE is a very low–cost interface for connecting standard IDE (AT) hard drives to any Amiga computer. If your goal is to add one hard drive to your computer for as little money as possible, then AdIDE could be the answer.

AdIDE installs easily, connecting between the 68000 CPU and its socket. Then simply mount the drive and connect a ribbon cable to both devices and you are ready to go.

AdIDE uses the same advanced formatting program and driver software included with our AdSCSI host adapters, so you won't be sacrificing performance for price. Using one of the new 2-1/2" low power IDE drives, you can even install a drive inside your 500!

Flicker Free Video

Flicker Free Video (FFV) is the answer for any Amiga owner who would like to get the extra resolution of an interlaced display but can't handle the resulting flicker. With a standard VGA or multi-sync monitor, FFV will give you a stable jitterless display free of any visible scan lines.

Compatible with low and high resolution, interlaced and non-interlaced displays, FFV doesn't stop where others have. It offers automatic NTSC and PAL switching, full overscan support, and no adjustments ever. Once you see the display that FFV and your Amiga 500, 1000, or 2000 will produce, you won't be able to go back.

PAL mode requires a multi-sync monitor.